

JRC SCIENCE FOR POLICY REPORT

RIO Country Report 2016: Belgium

*Research and
Innovation Observatory
country reports series*

Kelchtermans, S
Robledo Böttcher, N

2017



This publication is a Science for Policy report by the Joint Research Centre (JRC), the European Commission's science and knowledge service. It aims to provide evidence-based scientific support to the European policymaking process. The scientific output expressed does not imply nor prejudice policy positions of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use that might be made of this publication.

Contact information

Email: JRC-B7-NETWORK@ec.europa.eu

JRC Science Hub

<https://ec.europa.eu/jrc>

JRC105859

EUR 28498 EN

PDF	ISBN 978-92-79-66212-6	ISSN 1831-9424	doi:10.2760/273083
-----	------------------------	----------------	--------------------

Print	ISBN 978-92-79-69856-9	ISSN 1018-5593	doi:10.2760/154917
-------	------------------------	----------------	--------------------

Luxembourg: Publications Office of the European Union, 2017

© European Union, 2017

The reuse of the document is authorised, provided the source is acknowledged and the original meaning or message of the texts are not distorted. The European Commission shall not be held liable for any consequences stemming from the reuse.

How to cite this report: Kelchtermans, S, Robledo Böttcher, N; *RIO Country Report 2016: Belgium*; EUR 28498 EN; doi:10.2760/273083

All images © European Union 2017, except for the ERA Dashboard image on the first page by Niels Meyer licensed under CC BY 2.0

Research and Innovation Observatory Country Report 2016 Belgium

The 2016 series of the RIO Country Report analyses and assesses the development and performance of the national research and innovation system of the EU-28 Member States and related policies.

It aims at monitoring and evaluating the EU policy implementation as well as facilitating policy learning in the Member States.

Contents

Foreword	4
Acknowledgements	5
1. Main R&I policy developments in 2016	7
1.1 Focus on National and Regional Smart Specialisation Strategies	8
2. Economic Context	9
2.1 Structure of the economy	10
2.2 Business environment	10
2.3 Supply of human resources	10
3. Main R&I actors	10
4. R&I trends	12
4.1 Public allocation of R&D and R&D expenditure	12
4.2 Private R&D expenditure	12
4.3 Public sector innovation and civil society engagement	13
5. Innovation challenges	14
5.1 Challenge 1: Promote fast growing enterprises in innovative sectors.....	14
Description	14
Policy response.....	15
Policy Assessment.....	16
5.2 Challenge 2: Addressing the expected shortage of human resources for R&I.....	16
Description	16
Policy response.....	17
Policy Assessment.....	18
6. Focus on creating and stimulating markets	18
References	20
Abbreviations	22
Factsheet	24
List of Figures	25

Foreword

This report offers an analysis of the R&I system in Belgium for 2016, including relevant policies and funding, with a particular focus on topics of critical importance for EU policies. The report identifies the main challenges of the Belgian research and innovation system and assesses the policy responses implemented. It was prepared according to a set of guidelines for collecting and analysing a range of materials, including policy documents, statistics, evaluation reports and online publications. The quantitative data are, whenever possible, comparable across all EU Member State reports. Unless specifically referenced, all data used in this report are based on Eurostat statistics available in January 2017. The report contents are partly based on the RIO Country Report 2015 (Kelchtermans and Zacharewicz, 2016).

The analysis does not take into account the full set of CIS 2014 data that was released mid-January 2017. The factsheet in Annex include however the most recent data including one indicator from the last wave of the Community Innovation Survey.

Acknowledgements

This report has benefited from the comments and suggestions of Koen Jonkers and Thomas Zacharewicz of Unit B.7-JRC EC.

Comments from DG Regional and Urban Policy and DG Research and Innovation as well as from the Belgian authorities through the coordination of the Belgian Science Policy Office are also gratefully acknowledged.

Authors

Stijn Kelchtermans, KU Leuven (Leuven, Belgium)

Nicolas Robledo Böttcher, European Commission, Directorate-General Joint Research Centre, Directorate B – Growth & Innovation, Knowledge for Growth, Finance & Innovation unit (Brussels, Belgium)

HIGHLIGHTS

- Total gross domestic product (GDP) was €410.351b (at market prices) in 2015 (2.8% of EU28). Per capita GDP in 2015 was €36,600. This is 26.64% above the EU28 average (i.e. €28,900).
- The business and innovation environment subindex of the WEF Networked Readiness Index 2016 ranks Belgium 22nd (out of 138) for its business and innovation environment.
- The Digital Economy and Society Index places Belgium 5th out of 28 EU Member States in 2016, maintaining its 2015 position.
- Industry succeeds in attracting a large pool of the outflow of doctorate holders from Belgian universities, nevertheless a number of challenges in attracting research talent remain, such as the relatively low salary of researches compared to the private sector or a mismatch in the supply and demand for high-skilled researchers and engineers
- GERD has remained essentially constant at 2.45% of GDP in 2015 compared to 2.46% in 2014.

MAIN R&I POLICY CHALLENGES

- **Promote fast growing enterprises in innovative sectors.** Despite Belgium's scientific strength and the substantial science-industry collaboration, the economic impact of these efforts remains a concern. In particular, the number of fast-growing firms active in innovation-performing sectors is low and, consequently, also their share of employment. High-growth enterprises account for only 5.9% of all employment, compared to the EU average of 9.1%
- **Addressing the expected shortage of human resources for R&I.** While the labour force in Belgium is generally well-qualified, the share of science, technology, engineering and mathematics (STEM) graduates is comparatively low at 15.74% (EU28: 25.44%). Demand has also exceeded the number of graduates for the last years. Shortages in these fields are considered as a potential major barrier for future innovation and economic growth. It is thus paramount to increase the number of STEM-qualified people in every region as this high-skilled labour force is necessary for further improving R&I performance.

MAIN R&I POLICY DEVELOPMENTS IN 2016

- [Federal Royal Decree allowing night shifts for executing e-commerce activities](#)
- [Federal Programme Law for the sharing economy](#)
- [Federal Open Data Strategy](#)
- [Decision of the Flemish Government for regulating the support of innovation clusters](#)
- [Flemish Plan for Government Procurement and Action Plan for Innovative Procurement\(incl. innovative procurement\)](#)
- [SME growth subsidy](#) (VLAIO, Flanders)
- [Reorganisation of the Flemish public R&D&I landscape](#)
- [Wallonia Small Business Act](#) (Wallonia)
- [Legislative proposal for refinancing higher education](#) (Wallonia-Brussels Federation)
- [W.IN.G](#) (Wallonia Innovation & Growth)
- [Small Business Act](#) (Brussels-Capital Region)
- [PREC](#) (Brussels-Capital Region)
- [PRI](#) (Brussels-Capital Region)

1. Main R&I policy developments in 2016

<u>Federal Royal Decree allowing night shifts for executing e-commerce activities</u>	Regulation of night shifts for executing e-commerce activities.
<u>Federal Programme Law for the sharing economy</u>	Provides a legal framework for the "sharing economy".
<u>Federal Open Data Strategy</u>	Besides implementing the 2013 PSI Directive on the re-use of government data, the strategy outlines Belgium's open data strategy.
<u>Decision of the Flemish Government for regulating the support of innovation clusters</u>	Outlines the conditions for support for 2 types of innovation clusters. After a call, 13 innovative business networks (small-scaled clusters) are being supported, and 4 spearhead clusters (large-scaled clusters) receive support to take-off as of 2017
<u>Flemish Plan for Government Procurement</u> <u>Action Plan for Innovative procurement (Flanders)</u>	<p>Implementation of a procurement policy for the Flemish Government, incl. innovative procurement.</p> <p>New Flemish action plan for innovative procurement for July 2016 - end 2019.</p>
<u>SME growth subsidy (VLAIO, Flanders)</u> <u>Reorganisation of the public Flemish R&D&I landscape (Flanders)</u>	<p>50% co-financing of external advice or the hiring of a strategic manager to support a growth strategy.</p> <p>Establishment of Flanders Innovation and Entrepreneurship, AIO, now the one-stop-shop for companies in Flanders, and incorporation of the Hercules Foundation into Research Foundation Flanders, FWO, now the one-stop-shop for researchers.</p>
<u>Wallonia Small Business Act (Wallonia)</u>	Aims (among other things) at making the administrative procedures between SMEs and the Walloon authorities smoother by streamlining the interaction process.
<u>Legislative proposal for refinancing higher education (Wallonia)</u>	Legislative proposal for refinancing higher education for an amount of €107.5 million in 2016-2019.

<u>W.IN.G</u> (Wallonia Innovation & Growth)	Equity platform for financing the growth of digital start-ups, as part of the digital Wallonia strategy.
<u>Regional Innovation Plan</u> (Brussels-Capital Region)	Full-scale update of the BCR's R&D&I policy framework, including many new funding schemes and an enlarged scope in terms of actors and forms of innovation.
<u>Small Business Act</u> (Brussels-Capital Region)	Sets out the BCR's guidelines regarding an inclusive SME and entrepreneurship policy, including fostering innovation among these companies.
<u>Regional Circular Economy Programme (PREC)</u> (Brussels-Capital Region)	Promotes an innovative regional economy by mobilising resources and minimising waste.
Participation in ESA Federal Science Policy Office (Belspo)	Participation in the space summit (ESA) - Lucerne, Suisse, 1st and 2nd of December 2016 : "Towards Space 4.0 for a United Space in Europe".
Institutional changes regarding the federal science policy office Federal Science Policy Office (Belspo)	Decision of the council of ministers (25th of November 2016) to create a space agency and integrate the Federal Science Policy Office (Belspo) into the Federal Department of Economics

1.1 Focus on National and Regional Smart Specialisation Strategies

Description and timing: Belgium's Research for Smart Specialisation (RIS3) is performed at the regional level and every region has its competence in the matter. Flanders and Wallonia implement a cluster policy addressing various thematic areas whereas the Brussels-Capital region primarily focuses on ICT, life sciences, and environment.

New Developments: In **Flanders** the phased plan of the [concept note](#) ('A smart specialisation strategy for a targeted cluster policy') included a pre-roadmap for a policy of advanced clusters during the legislative period 2014-2019. Since November 2013, pilot trajectories have been started in the fields of sustainable chemistry, additive manufacturing and materials to develop a partnership for designing a cluster roadmap.

The policy note Work, Economy, Science and Innovation 2014-2019 from the new minister announces the elaboration of a new targeted cluster policy with 2 types of clusters. For both the innovative business networks (IBN) and spearhead clusters several initiatives were approved in 2016. In October 2016, iMinds was integrated as an additional business unit within imec, resulting in a new research centre that fuses the

technology and systems expertise of more than 2,500 imec researchers worldwide with the digital competencies of some 1,000 iMinds researchers.

These pilots for developing new cluster policies explored the conditions for strategic cooperation between government services and cluster organisations on a wide range of policies (e.g. innovation, training, trade, regulation) that are needed to accomplish the transformation objectives with roadmaps for concrete cases.

In **Wallonia**, the latest extension of the multi-year strategy, the Marshall Plan 4.0 (2014-2019), announced the intention to renew the strategy of the competitiveness poles and to recast the R&D&I Decree to buttress the smart specialization strategy. With respect to the latter, the Walloon Parliament has adopted a [new R&D&I Decree](#) in May 2015, revising the previous law of 2008. A first key principle behind the reform is to apply the excellence criterion already used for deciding on support to the competitiveness poles also more manifestly to research projects. Second, the decree foresees in administrative simplification by reducing the types of projects from 10 to 3. Finally, closer alignment of priority research domains with 6 competitiveness poles is expected to strengthen industry-science links. Up to now, 6 competitiveness poles have been created in the areas of logistics, aerospace, health, agro-food, mechatronics and green technologies. For their specific support, the Government has developed a policy mix for investment (typically co-financing), R&I, exportation and FDI, training and networking. The competitiveness poles are complemented by 7 clusters of firms (mostly SMEs) that were defined in a bottom-up fashion.

The **Brussels Capital Region** identified its priorities to be in the domains of ICT, life sciences, and environment. The Bridge programme, formerly known under the name 'strategic platforms' was launched for the first time in 2010. It was inspired by the Regional Plan for Innovation (PRI) and aims to reinforce measures taken since 2006 in the frame of so-called "impulse" programmes. In addition, Strategy 2025 (approved in June 2015) puts forward support for research and innovation as one of its 18 objectives. One of the operational targets within this objective is to make the transition to a "Smart City", whereby the precise needs will be determined in conjunction with the smart specialisation strategy that will have been detailed in the new Regional Innovation Plan (2015-2020, under construction, which has been adopted by the Government of the BCR

Outstanding issues: the development of smart specialization strategies is an ongoing exercise. For example, the [roadmaps for Key Enabling Technologies](#) (KETs) that were developed in Flanders in 2015 need further refining and updating to guide further system innovation, exploiting the regional strengths and identify cross-KET synergies. Further, in November 2016, the Vanguard Initiative on smart specialization, of which both the Flemish and Walloon Region are members, adopted a [position paper](#) on the post-2020 European smart specialization policies. Amongst others, it advocates a more innovation oriented and demand driven bottom-up approach for the identification of commercial opportunities towards industry-led modernizations.

2. Economic Context

Belgium's total gross domestic product (GDP) was €410.351b (at market prices) in 2015 (2.8% of EU28). Per capita GDP in 2015 was €36,600. This is 26.64% above the EU28 average (i.e. €28,900). There are significant regional differences in the GDP per capita: Wallonia lies just below the EU28 average (98.3% in 2010), Flanders lies well above (132.7%) and Brussels-Capital lies extremely high above (250.2%).

Labour productivity growth in Belgium was 0.8% in 2014, compared to 0.2% for the EU28.¹ Multifactor productivity growth – the part of GDP growth that cannot be explained by changes in labour and capital inputs – equalled 0.48% in 2014, just below Germany (0.50%) and the Netherlands (0.54%). Within the EU28, only Sweden (0.61%) performed better in 2014.

¹ See <https://data.oecd.org/lprdy/labour-productivity-and-utilisation.htm> (last consulted 08/2016).

2.1 Structure of the economy

In terms of the economic structure, the share of industry in value added has steadily declined, from 19.9% in 2003 to 14.3% in 2015. In terms of employment, the services sector is the most important, with 80.4% of total employment in 2014 (versus 73.2% for the EU-28). Conversely, 11.3% of the labour force in 2014 was active in the manufacturing sector compared to 14.0% for EU-28. High-tech and medium high-tech manufacturing accounted for respectively 3.7% of employment in 2014.

2.2 Business environment

The business and innovation environment subindex of the WEF Networked Readiness Index 2016 shows reasonable, but not leading scores for Belgium for its business and innovation environment (ranked 17th out of 138). As far as access to finance is concerned, measures to encourage venture capital and tax deductions for reinvested profits, and to facilitate SMEs' access to Structural funds, could still be further developed (SBA Factsheet 2015). Nevertheless, Belgium performs relatively well with respect to SMEs' access to finance, showing above-average scores compared to other EU countries (SBA Factsheet 2015).

Regarding digital infrastructure and services, the Digital Economy and Society Index places Belgium 5th out of 28 EU Member States in 2016, maintaining its 2015 position. Nevertheless the shortage of ICT specialists is a well-known weakness.²

2.3 Supply of human resources

Industry succeeds in attracting a large pool of the outflow of doctorate holders from Belgian universities, and this group has been continuously increasing over recent years: in a period of ten years 6% more doctorate holders have made a career turn from academics to industry (CDH survey, 2010). The third most important employer of doctorate graduates is government. Government employs on average 10% of all doctorate holders and this percentage does not fluctuate much.

Nevertheless a number of challenges in attracting research talent remain. First, the remuneration of researchers is relatively low compared to the private sector, even though (early-stage) Belgian researchers are relatively well-paid compared to their counterparts in other countries. Second, participation of women in research remains low, although improving. Third, a mismatch exists in the supply and demand for high-skilled researchers and engineers, with a shortage in the fields of physics, chemistry and IT. Finally, in an EU perspective, community regulations prescribe the use of the official language at Higher Education Institutions (HEIs), which can be a barrier to foreign researchers.

3. Main R&I actors

The Belgian regions have authority on research policy for economic development purposes, thus encompassing technological development and applied research and all valorisation purposes, including strategic research centres and other knowledge centres. The communities (French Community, Flemish Community and German-speaking Community) are responsible for education and fundamental research (including strategic basic research) at universities and higher education establishments, including the Community scientific institutes. Access to finance is also a regional competency. The Federal Government is in charge of the federal scientific institutes, intellectual property (IP) law, standardisation, fundamental metrology, nuclear energy research polar research, defence research, public health research, corporate taxation, employment legislation and social security. The R&D tax credit, a major policy instrument in Belgium,

² In 2015, 46.1% of enterprises with job vacancies requiring specialized ICT skills reported problems in filling these positions. For the ICT workforce alone, the shortfall is estimated to rise from about 8,000 persons in 2012 to 30,000 in 2020 (DESI Index 2016, Country profile for Belgium). The lack of ICT-related human capital ties into the broader debate on (low) number of STEM graduates in Belgium.

is a competence of the federal state. It also acts on behalf of all entities regarding research that is part of international agreements, such as space research, for which end November 2016 a new agency has been established in which the regions are part of the management.

The Belgian research system is highly “devolved” due to the federalisation process of the last 28 years that has gradually split competencies and transferred them from the federal level to the regions and communities. Belgium has seventeen federal scientific institutes, which are of diverse types and cover a wide variety of research activities and collections. At the administrative level, they are managed by various policy fields and 10 of these institutes are under the overall responsibility of the federal Minister for Science, as part of the Programmatory Public Service (PPS) for Science Policy, [Belspo](#). These scientific establishments have a two-fold mission: a scientific public service mission (the development, maintenance and dissemination of scientific, technical and cultural information and documentation, collection conservation, etc.) and a research mission (through research often conducted in partnership with the universities of the Flemish and/or French Community). The Federal Government also has responsibility for two other research organizations: the [National Institute for Radio-elements](#), and the renowned [Nuclear Energy Centre](#) (SCK or CEN).

The main sectors that conduct research are life sciences and chemistry, ICT and communications, and the electrical machinery and apparatus industry.

In **Flanders**, there are five Scientific institutes, and 4 strategic research centres, and a set of other knowledge centres in various domains (marine sciences, tropical medicine etc). In **Flanders**, the universities represent the first pillar of the higher education system and represent the major part of the scientific output in the Flemish R&D ecosystem: the universities generate almost 90% of all public scientific output in Flanders (Geerts *et al.*, 2014). The five universities of the Flemish Community are: the [Katholieke Universiteit Leuven](#) (KU Leuven), [Universiteit Gent](#) (UGent), [Universiteit Antwerpen](#) (UA), [Vrije Universiteit Brussel](#) (VUB), and [Universiteit Hasselt](#) (UHasselt). At the public authority level, the policy domain of economics science and innovation was reorganized involving major changes in 2016. The new Agentschap voor Innoveren en Ondernemen, AIO (Flanders Innovation and Entrepreneurship) has started as of 2016 and acts as the one-stop-shop for support for companies. Three IWT programmes focusing on strategic research have been transferred to the Research Foundation Flanders (FWO). FWO as of 2016 also incorporates the activities of the Hercules Foundation (support for research infrastructure) and now acts as the one-stop-shop for researchers in Flanders.

In the **Wallonia-Brussels Federation** universities also play a key role as research performers. The 6 universities are: the [Catholic University of Louvain](#) (UCL), [Saint-Louis University](#), Brussels (USL-B), the [University of Namur](#) (UNamur), the [Free University of Brussels](#) (ULB), the [University of Mons](#) (UMons) and the [University of Liège](#) (ULg). The (KMS-ERM), a federal institution, completes the higher education R&D ecosystem.

The Belgian business enterprise sector is very heterogeneous in terms of R&D and innovation, with a strong presence of sectors like pharmaceuticals and chemicals, which are characterized by high R&D intensities. Most large companies are clearly innovation-active (CIS survey, 2013). Most of these large enterprises belong to multinational groups, so that their research and innovation policy is not exclusively determined in Belgium. In 2015, the R&D intensity in the business sector was 1.77%. Belgium therefore ranks higher than the EU-28 average and the Netherlands, but distinctly lower than the Scandinavian countries, Germany, the USA and Japan.

Even though the large majority of SMEs do not conduct research directly, many of them outsource research to some extent, buy innovation elsewhere or are active in networks, so that they can also be regarded as innovation-oriented. The CIS survey results for

Belgium confirm the high proportion of innovative companies overall. Nevertheless, innovation continues to be largely concentrated in industry and large companies.

In addition to the higher education and business sectors, Belgium has an additional type of R&D actor: the collective research centres. These fourteen sector-specific centres are established as public-sector entities, but in close cooperation with the relevant sector's business federation. They perform research on behalf of and provide technical and scientific services to businesses in these sectors.

4. R&I trends

4.1 Public allocation of R&D and R&D expenditure

Total GERD in Belgium was €10,072.4m in 2015. The breakdown by funding source (using the most recently available data of 2013), shows the following distribution: the business sector (€5,435m), the government (€2,717m), and foreign funding (€1,257m)³. Direct funding from the government goes to business enterprises (€827m), the government (€431m) and the higher education sector (€1,448m).

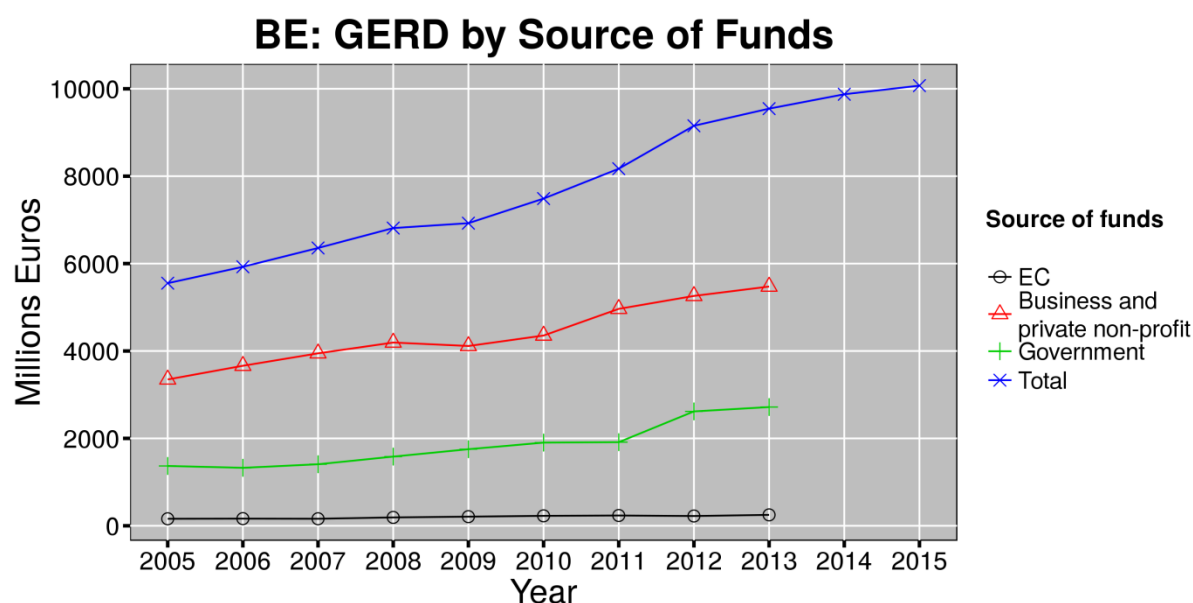


Figure 1 Trend of GERD by source of funding.

Data source: Eurostat, November 2016.

The total GERD increased almost linearly in the period 2005-2013, with a flattening in 2009 as a consequence of the decrease in funding from the private sector that year. The private sector is the main funder of the Belgian GERD. The gap with the contribution from the government appears to be growing after 2009, due to the faster growth of the R&D funding from the private sector. The funding from the European Commission remains roughly constant in the period under scrutiny, amounting to roughly 12% of the GERD funded by the government (see Figure 1)⁴.

4.2 Private R&D expenditure

The economic sector that was mainly responsible for the increase in BERD is pharmaceuticals (NACE C21). There are more than 200 pharmaceutical companies in

³ 2013 data

⁴ A regional breakdown for 2013 can be found [here](#) on sheet R5.

Belgium⁵. The largest Belgian based R&D performer is UCB, spending over 786 million euro in R&D in 2014 and ranking 50th on the 2015 Industrial R&D scoreboard of top R&D spenders in the EU. In 2012 it received a €200+ million loan from the EIB for investing in the development of new drugs. Other pharmaceutical firms with R&D activities include the former Solvay Pharmaceuticals (now Abbott) and R&D labs of other large pharmaceutical companies such as Janssen (part of Johnson and Johnson). In addition, there are a number of smaller pharmaceutical biotech firms active in Belgium, including Thrombogenics (707th in the 2015 scoreboard) and Ablynx (989th). The biopharmaceutical research industry in Belgium is R&D intensive and invests a comparatively large share of its turnover in R&D in Belgium, to almost €2.6 billion in 2015.⁶

The top sectors in terms of business R&D are pharmaceuticals (sector CF, 28.8% of total business R&D expenditure in 2013), scientific R&D (MB, 10.4%), Manufacture of computer, electronic and optical products (CI, 7.1%) and IT & information services (JC, 6.3%). In terms of recent evolutions, the BERD in the Manufacture of computer, electronic and optical products (NACE C26) in 2010 and 2011 was lower than the 2008 values, but regained its 2008 levels in 2013. There is a decrease in R&D expenditure by Agfa-Gevaert (171th in the 2015 ranking) in 2012 and 2013, but this doesn't fully explain the drop in C26 BERD. The chemical sector (NACE C20), with one of Belgium's leading Scoreboard companies Solvay (95th) declines after a peak in 2011, but remains also in 2013 above 2008 levels of BERD⁷.

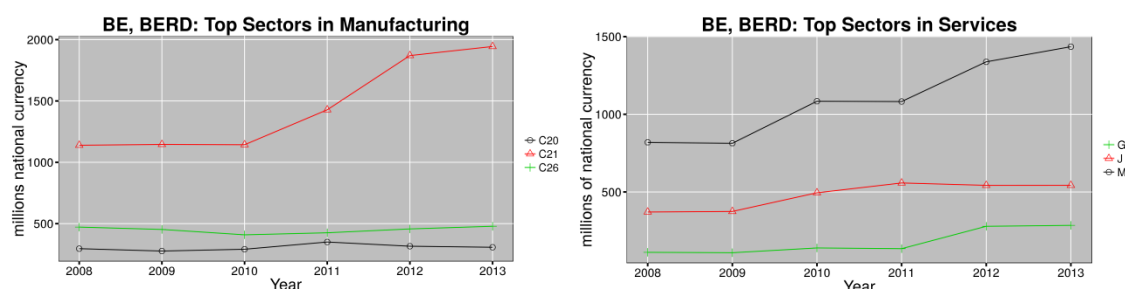


Figure 2. Top sectors in manufacturing (C20: Manufacture of chemicals and chemical products; C21: manufacture of basic pharmaceutical products and pharmaceutical preparations; C26: Manufacture of computer, electronic and optical products). Top service sectors (G=wholesale and retail trade, repair of motor vehicles and motorcycles, J=information and communication, M=professional, scientific and technical activities).

The most important contribution to the BERD increase comes from the combined services sectors, especially professional, scientific and technical activities (NACE M) and Information and Communication (NACE J). In the former (M), which is the service sector with the highest levels of BERD, BERD increased by over 50% between 2009 and 2013. While part of this increase may be due to the outsourcing of R&D activities by Belgian SMEs, internal R&D expenditures also show an increasing trend. The increase in R&D tax incentives may have contributed to this development as well. The information and communication sector also experienced a growth in BERD between 2009 and 2011 after which it flattened out. Wholesale and retail trade witnessed a considerable BERD increase between 2011 and 2012. While BERD remained stable in 2008-2009, all the service sectors studied increased in the post-crisis period. The share of the sectors G-N in total BERD increased from 33 to 37 % between 2008 and 2013.

4.3 Public sector innovation and civil society engagement

⁵ <http://pharma.be/nl/focus/economische-footprint/farmasector-belgie.html>

⁶ <http://pharma.be/nl/focus/economische-footprint/farmasector-belgie.html>

⁷ http://www.innovationdata.be/i/RD_03/Business-enterprise-RD-expenditure-top-four-economic-activities

The rising trend in the online availability of public services (and their use) is demonstrated by the fact that in 2015 more than half of citizens (52%) interacted with public authorities via the Internet, up from 41% in 2009. This increasing take-up of information and communication technologies to deliver government services is also reflected in Belgium's ranking based on the UN E-Government Survey (from 25th worldwide in 2014 to 19th in 2016). There is also an increasing trend in the share of businesses who won at least one public procurement contract (28% in 2015, an increase of 7 percentage points), or who participated in a tender for a public procurement contract but without success (24% in 2015, + 5pp).⁸

A number of Citizen Science initiatives have recently been launched in Belgium. In **Flanders**, the web site '[Iedereen Wetenschapper](#)' ('Everyone a Scientist') was launched in 2015. It is an initiative of the science magazine EOS, supported by Scientific American and the association of young academics ('[Jonge Academie Vlaanderen](#)'). It is part of the international Citizen Science Association and the European Citizen Science Association (ECSA). Public research organizations have also taken action to engage citizens, for example to collect data. At **all levels**, the phenomenon of hackathons, open events where people can join a collaborative effort on software projects, is also becoming more prevalent. A recent example is the '[Citizens of Wallonia](#)' hackathon in March 2016, dedicated to the development of new service applications targeting well-being, employment and education ('university 2.0'). The event joined different types of partners: technological (e.g. IB), educational (University of Mons) and governmental (e.g. the Digital Wallonia agency). In **Brussels**, the [Urban Bee Lab](#) brings together artists, scientists, beekeepers, technicians and creative people to study the interaction between city honeybees and urban ecosystems. It supported by the Free University of Vrije Universiteit Brussel (VUB), Sony Corporation, the DG Culture of the European Commission, and the Flemish Community. Innoviris, the Brussels institute for research and innovation, also supports a wide range of sensibilisation and citizen science activities, as well as the new "Co-Create" funding scheme for collaborative science projects.

5. Innovation challenges

5.1 Challenge 1: Promote fast growing enterprises in innovative sectors

Description

Belgium has a strong science performance (around 1.75% BERD intensity, compared to 1.3% EU28 and around 0.073% of GDP is spent by the public sector but financed by business enterprises, compared to 0.05% at EU28 level). However, the strong science base and its interactions with business do not seem to translate sufficiently into innovation output and economic performance. This is illustrated by the European Innovation Scoreboard 2016, which shows that Belgium performs slightly worse than the EU average with respect to indicators capturing "economic effects" of research and innovation (e.g. Medium and High Tech product exports, Sales of new to market and new to firm innovation). There is thus still margin for improvement regarding the transfer of its scientific and innovative capabilities into clear economic benefits.

One particular economic performance measure that raises concern is the lack of fast-growing firms in innovative sectors since these firms make a significant contribution to job creation (Commission Staff Working Document: Country Report Belgium 2016). With a share of employment in high-growth enterprises of only 5.9 %, Belgium is well under the EU average of 9.1 % (Belgium ranks 23rd in the EU for this indicator). In addition, many fast-growing Belgian firms operate in sectors which are traditionally non innovative, such as construction and transport (Commission Staff Working Document:

⁸ Innobarometer 2015. http://ec.europa.eu/growth/industry/innovation/facts-figures/innobarometer_en (last consulted 08/2016).

Country Report Belgium 2016). Efforts have nevertheless been made to promote innovation inside these traditionally non-innovative sectors, such as the Brussels-Capital Region's Retrofit Living Lab in the construction sector. It should be noted that the indicator base to support this challenge is rather limited since few indicators directly and jointly capture innovativeness, size and growth at the company level. There is also a clear lack of 'flow' indicators that allow assessing, for example, the extent to which high-growth innovative enterprises in Belgium tap into the country's strong science base, through the systematic linkage of references in patent documents to scientific publications.

Economic growth depends critically upon innovative fast-growing firms, which also generate a disproportionately large share of jobs (European Semester Thematic Fiche Research and Innovation, 2016). Given the growth challenge facing Belgium – and Europe as a whole – and the pivotal role of high-growth, innovative SMEs, increasing their prevalence is a key policy challenge. Enabling such enterprises to emerge and develop will support structural change and provide an important impetus to the country on its path towards a more knowledge-oriented and innovation-driven economy.

Policy response

In **Wallonia**, the main strategic agenda is given by the [Marshall Plan 4.0](#) (approved in May 2015), which aims at making the region more competitive and which provides the framework for many initiatives such as the Walloon Small Business Act. The Marshall Plan 4.0 envisages fomenting the creation of enterprises by making the workforce more entrepreneurial via the "entrepreneurial generations 2015-2020" project. This project encourages the creation of enterprises by making study programs more entrepreneurially oriented, boosting investment in future entrepreneurs and encouraging female entrepreneurship. The Marshall Plan 4.0 also develops competitive clusters, based on the rationale of smart specialisation. New instruments that foster the creation of innovative enterprises include W.IN.G, an equity platform for financing the growth of digital startups, and the "[charte bancaire](#)" a charter between the Walloon Government and [Febelfin](#) (the Belgian federation of the financial sector) to improve access to finance for SMEs. The latter measure is also part of the more comprehensive Walloon Small Business Act, which is a comprehensive plan to stimulate the creation and growth of SMEs.

In **Flanders**, the overarching strategic policy framework is "[Vision 2050](#)", which formulates long-term objectives for society – most of which have direct implications for R&I. With respect to initiatives that have an impact on creating and scaling up SMEs, one of the noteworthy new measures is the "[SME growth subsidy](#)", adopted in May 2016. The new instrument is directed at companies with growth plans (by innovating, expanding international activities or transforming the business with new activities), and reshuffles the former IWT starters' subsidy.

This programme is directed at companies with growth ambitions through innovation, international expansion or transformation of their business with new activities. In the same spirit, a key role in directly affecting the birth rate of high-tech firms is played by the strategic research centres, such as the business incubation programs of [iMinds \(now a part of Imec\)](#), which are supported by accompanying financing instruments such as the Spin-off Financing (SOFI) funds. Also, in 2015 the Government of Flanders adopted a [concept paper on entrepreneurship](#) with the promotion of ambitious entrepreneurship as guiding principle. It concerns the provision of services to companies regarding: (1) awareness raising, public perception of entrepreneurship, (2) guidance across the various life stages with focus on (pre)start and access to funding, financial literacy, support for businesses in difficulty, relaunch/restart after bankruptcy, monitoring & take-over and (3) networking targeted to (high) growth companies. Finally, Flanders wants to continue stimulating the spirit of enterprise and entrepreneurship through education through the "Entrepreneurial Education 2015-2019" plan, which was updated in late 2015.

In the **Brussels-Capital Region**, the long term strategic framework, "[Strategy 2025](#)", foresees financial help for innovative firms that develop economic activities fostering employment and value added.

In order to transfer scientific and technological knowledge from the scientific to the business, non-profit and government sector – with the explicit aim of economic valorization in the short to medium term - the Brussels-Capital Region has adopted since 2010 the "[Bridge Programme](#)". In addition to these specific support schemes the "Regional Innovation Plan" addresses the financing of innovative companies, directly as well as through the Brussels Regional Investment Company (S.R.I.B(G.I.M.B. / and its "Brustart" product Citydev has set up hosting and incubation structures, the Brussels Enterprise Agency (Impulse) coordinates several sectoral centers and helps companies to participate in European programmes. The new Regional Innovation Plan and its associated new R&D&I Ordinances (which are currently being adopted) also includes many new actions including support to knowledge transfer, an incubators' platform, co-creation, proofs of concept, living labs and collaborative prototyping and innovative services projects.

At **federal level**, various tax incentives for R&D are in place to encourage firms to strengthen their R&D base. The main measure is the partial exemption of the wage withholding for researchers, which is a measure with spillovers to other R&D policy domains as it strengthens the demand for highly qualified staff (see also challenge 2).

Policy Assessment

It is well-known that the very strong science base in Belgium is not translated into equally strong innovation performance, as indicated by for example its position on the IUS scoreboard. Despite the efforts aimed at fostering spillovers between the realms of science and innovation, there seems to be untapped potential when it comes to the creation of innovative firms and, especially, the scaling-up of such companies.

Various policy initiatives by the different governments do address this challenge. For example, there is growing attention for demand-side policies such as proof of concept funding and living labs.: Such schemes could be strengthened further, based on the rationale that they generate feedback from the market to research, ensuring that R&D is directed to those issues seen as most pressing by users. In addition, support measures could provide more incentives to steer innovative efforts to domains with a large growth potential.

Another promising prospect to capitalize further on Belgium's excellent science base is to make universities and public research organizations more entrepreneurial. While some universities already display strong performance in this respect, with for example the KU Leuven topping Reuter's "most innovative European university"-ranking⁹ in 2016, entrepreneurial universities and PROs could take up an even stronger role as catalysts of Triple Helix interactions.

5.2 Challenge 2: Addressing the expected shortage of human resources for R&I

Description

While the labour force in Belgium is generally well-qualified, the share of science, technology, engineering and mathematics (STEM) graduates is low at 15.74% compared to the EU28 average of 25.44%. While the share of STEM students in total inflow in higher education has shown an increasing trend in recent years, demand exceeds the number of graduates. Shortages in these fields are considered as a potential major barrier for future innovation and economic growth and are already emerging for certain functions, such as ICT experts. More generally, a skill mismatch is observable - particularly acute in the Brussels-Capital due to various demographic factors - and is

⁹ See <http://www.reuters.com/article/us-innovative-stories-europe-idUSKCN0Z00CT> (last consulted 08/2016).

mainly related to an undersupply of highly-skilled job-seekers and to an over-representation of low-skilled job seekers (RIO CR 2015 Belgium).

The Country Specific Recommendations for Belgium of June 2016 highlight the continued importance of human capital policy to boost the capacity to innovate. Note that this challenge is closely intertwined with the first one, since the presence of fast-growing firms in innovative sectors crucially depends on highly qualified human capital in the domains of IT, biotech, material science, etc.

Policy response

Several policy measures have been adopted at all levels to tackle the issue of human resources for innovation. The **federal government's** influence over this policy domain is only indirect, but nonetheless important. Through fiscal measures it exerts a substantial influence on the demand for highly skilled workers, in particular through the policy of a reduced wage withholding tax for researchers, which will be continued in the coming years (Federal Government Agreement, October 2014).

The [Marshall Plan 4.0](#) in **Wallonia** (in particular its Axis 1) aims to better align the supply of graduates in Wallonia to business needs (Commission Staff Working Document: Country Report Belgium 2016), amongst others through the set-up of an inventory of "professions of the future". In order to attract external talent, the region has also introduced the "[Beware Fellowships](#)" which are funding schemes to attract researchers¹⁰ in Wallonia / Wallonia-Brussels Federation. The "Beware Fellowships" (Belgium Wallonia REsearch) programs are co-financed by the COFUND program of the European Union (FP7 - Marie Curie Actions).

In **Flanders** joint efforts involving the policy domains of science and innovation on the one hand, and education and training on the other, have been launched to increase the number of secondary students in science, technology, engineering and mathematics (STEM subjects) and encourage them to opt for a career in exact sciences or technology (Commission Staff Working Document: Country Report Belgium 2016).

The "[STEM Action Plan 2012-2020](#)" is at its halfway point and has, among others, resulted in the STEM Monitor, an indicator dashboard that systematically tracks inflow into, and successful completion of, STEM studies at various levels of education.¹¹ From 2016 onwards the emphasis will be on target group policy (girls, technical and vocational secondary education and young people with a disadvantaged socio-economic background), as well as on the relevance of STEM to society.

The "[STEM Charter](#)" is rolled out on a large scale and already brings together more than 50 companies and organisations which have indicated that they lend their full support to the STEM initiative.

The **Brussels-Capital region** funds PhD studies involved in public-private collaborative projects through the [DOCTIRIS](#) programme. The Region also actively promotes STEM subjects at secondary schools, particularly among young people from disadvantaged backgrounds.

Policy attention in **all regions** has also increasingly turned towards attracting foreign researchers or researchers from the own Community that are active abroad, in Flanders ([Odysseus](#), [Pegasus 2](#)), Wallonia-Brussels Federation ([Ulysse](#)) and the Brussels Capital Region ([Attract](#)) (Commission Staff Working Document: Country Report Belgium 2016).

¹⁰ From all nationalities, including Belgian, under the condition to have spent less than 12 months over the last three years in Belgium.

¹¹ http://onderwijs.vlaanderen.be/sites/default/files/atoms/files/STEM_monitor_indicatoren_20160630_0.pdf (last consulted 08/2016).

Another noteworthy initiative in this regard is the plan of several universities to increase the number of Master programs offered entirely in English.

In the context of internationalisation Flanders has prepared its own ERA roadmap regarding the completion of the European Research Area. This road map was submitted to the EC in 2016, just like the Belgian ERA road map. Within the framework of research infrastructure a Flemish ESFRI (European Strategy Forum on Research Infrastructures) road map was further prepared in 2016.

Policy Assessment

The European Semester report 2016 highlights various framework conditions that are of relevance for Belgium, e.g. accessibility and efficiency of direct support, a well-considered policy mix, etc. The report also emphasizes the importance of the availability of a workforce with adequate skills, as part of creating an investor-friendly environment (European Semester 2016, thematic fiche on R&I, p9). While recent policy initiatives address several framework conditions, including education, it is important that the attention for human capital in R&I policy is sustained in the coming years. Addressing the HR challenge is complex as it involves a very diverse set of issues, such as reducing early school leaving, increasing the supply of STEM-educated people through the own education system and attracting foreign talent, balancing the supply-demand skill mismatch over a broad set of domains, etc. Moreover, a particular challenge of human capital policy is that it typically takes a long time for effects of interventions in the education system to materialize. Various policy initiatives have been taken over the years and progress is being observed towards addressing skill mismatches and early school leaving (EC, 2015). Particularly commendable are the efforts to increase inward mobility of human capital, and the introduction of more flexible higher education trajectories to mitigate the strict separation of education and work.

The measures that have been taken in the last year denote a clear awareness of the human resource challenge at all government levels. New initiatives should be informed by supranational coordination efforts and international best practices. Supranational coordination efforts and international best practices may provide useful benchmarks – as should become clear from policy evaluations – for developing new initiatives.

Finally, with respect to strengthening STEM education, further structural steps could be made. This includes the orientation of STEM curricula towards societal challenges and the creation of more structural collaboration between STEM teachers and scientists, such as through training opportunities for science teachers.¹²

6. Focus on creating and stimulating markets

This section aims at describing and assessing national level efforts to introduce demand-side innovation policies to stimulate the uptake of innovation or act on their diffusion, including public procurement and regulations supporting innovation. It also analyses policy measures aimed at internationalisation of companies with the aim of increasing the innovativeness of the economy.

Although the Belgian authorities (collectively) have sought to use investment in space research (through the European Space Agency) as a form of pre-commercial public procurement, the use of public procurement to stimulate research and innovation is not yet widespread. Innovation-driven public procurement initiatives in Belgium have been mostly implemented in **Flanders** and managed by the Agency for Innovation by Science and Technology (IWT) but also **Brussels** and **Wallonia** have adopted public

¹² http://www.ewi-vlaanderen.be/sites/default/files/rri_sep2016_aerts.pdf (last consulted 08/2016).

procurement initiatives. The new federal legal framework regarding public procurement will allow these initiatives to be expanded.

The IWT (as of 2016: AIO, Flanders Innovation and Entrepreneurship) developed a methodology which made a distinction between the procurement of existing innovations which were new to the procuring government service and purchases of solutions which required further research and development work. According to the Rekenhof (Court of Auditors) which carried out [an evaluation of the programme in 2015](#) (Rekenhof, 2015), these results are insufficient, as it considered that the programme often did not select the most appropriate projects with the greatest need for innovation fitting within the overarching innovation policy.

The Flemish Government developed the "[Government Procurement Plan of Flanders' government](#)" (*Plan overheidsopdrachten*) in follow-up of the original plan and informed by the Rekenhof evaluation, which was approved in January 2016 and aims among other to implement an innovation-oriented procurement policy within the Flemish Government.¹³ As a part of this overall plan, a new Flemish action plan for innovation procurement specifically was adopted in October 2016. The new action plan sets a target to dedicate at least 3% of Flemish public procurement expenditure to innovation procurement. In a first phase, the action plan aims to actively engage primarily public procurers in the priority domains highlighted in the Flanders Vision Nota 2050 (Energy, Healthcare, Industry 4.0, Circular economy, Housing,...) and in a second phase the action plan will be expanded across all areas of public interest.

a project titled "[Innovation for a future-oriented transversal policy](#)" (2016-2019) is being launched, with developing transversal innovation instruments as its main objective, in particular innovative procurement. The initiative of the Flemish Government in response to the evaluation carried out by Rekenhof is yet too early to assess as it has been adopted very recently.

As far as the internationalization of companies in Belgium is concerned, several policy measures are in place at all regions and also at federal level.

They fall into various categories, mainly policies concerning the various forms of public-private partnerships¹⁴ (e.g. the innovation platforms (now innovative business networks and from 2017 also the spearhead clusters)) in Flanders, the competitiveness poles in Wallonia, the strategic platforms in Brussels) or the "joint economic missions" of the Belgian Foreign Trade Agency and the wide range of support offered by the regional agencies¹⁵. *Work in progress. More information in the next version of the report.*

The high number of policies concerning firm internationalisation shows that Belgium attaches great importance to the openness of its economy. In terms of the costs for exporting and importing, Belgium performs in line with the EU average (SBA Factsheet 2015).

¹³

https://overheid.vlaanderen.be/sites/default/files/documenten/overheidsopdrachten/20160129_plan%20overheidsopdrachten.pdf (last consulted 08/2016).

¹⁴ These structures provide connection points for foreign companies to tap into the strong science and research base in Belgium in order to strengthen their innovation activities. See for example the ongoing projects of the FISCH, the Innovation Platform competence pool for sustainable chemistry, now part of a spearhead cluster: <http://www.fi-sch.be/en/overview-projects/> (last consulted 08/2016).

¹⁵ For example, the agency Flanders Investment & Trade (FIT) has 90 offices worldwide to answer questions of exporting Flemish companies on their target markets. In Wallonia, the Agence Wallonne à l'Exportation et aux Investissements étrangers (AWEX) plays the same role, offering support with respect to a wide range of issues (legal, logistical, financial...).

References

- Belspo (2010), Careers of Doctorate Holders Survey.
<https://www.belspo.be/belspo/ScienceConnection/012/CareersDoctorateHolders.pdf>
- ECOOM (2013), Community Innovation Survey.
https://www.ecoom.be/sites/ecoom.be/files/downloads/CIS2013_Rapport_Finaal_update_tabel_8.docx.pdf
- European Commission (2016), RIO Country Report Belgium 2015. JRC Science and Policy Report. Joint Research Centre, Directorate B: Growth & Innovation. Report prepared by Stijn Kelchtermans and Thomas Zacharewicz.
<https://rio.jrc.ec.europa.eu/en/country-analysis/Belgium/country-report>
- European Council (2014), Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. <https://ec.europa.eu/research/innovation-union/pdf/state-of-the-union/2013/research-and-innovation-as-sources-of-renewed-growth-com-2014-339-final.pdf>
- European Council (2016), [Country Specific Recommendation: Belgium 2016](http://data.consilium.europa.eu/doc/document/ST-9190-2016-INIT/en/pdf)
<http://data.consilium.europa.eu/doc/document/ST-9190-2016-INIT/en/pdf>
- European Commission (2016), [Country Report 2016: Belgium, DG RTD](https://rio.jrc.ec.europa.eu/en/library/research-innovation-2016-european-semester-country-reports)
<https://rio.jrc.ec.europa.eu/en/library/research-innovation-2016-european-semester-country-reports>
- European Commission (2016), Commission Staff Working Document, Country Report Belgium 2016 http://ec.europa.eu/europe2020/pdf/csr2016/cr2016_belgium_en.pdf
- European Commission (2016), European Semester Thematic Fiche Research and Innovation,
http://ec.europa.eu/europe2020/pdf/themes/2016/research_innovation_201605.pdf
- Government of Flanders, Flemish Reform Programme 2016
<https://www.vlaanderen.be/nl/publicaties/detail/flemish-reform-programme-2016-1>
- Government of Flanders, STI in Flanders: Science, Technology & Innovation. Policy & Key Figures – 2015 <http://www.vlaanderen.be/nl/publicaties/detail/sti-in-flanders-science-technology-and-innovation-policy-and-key-figures-2015-1>
- European Commission (2016), National Reform Programme Belgium 2016
http://ec.europa.eu/europe2020/pdf/csr2016/nrp2016_belgium_en.pdf
- European Commission (2016), European Semester Thematic Fiche: Research and Innovation <https://rio.jrc.ec.europa.eu/en/library/european-semester-thematic-fiche-research-and-innovation>
- Conseil Économique et Social de Bruxelles, Stratégie 2025 pour Bruxelles
<http://www.ces.irisnet.be/fr/publications/autres-publications-1/autres-publications-du-conseil/16-juin-2015-1>
- Government of Wallonia, Marshall Plan 4.0,
http://www.wallonie.be/sites/wallonie/files/pages/fichiers/synthese_plan_marshall_4.0.pdf

European Commission (2016), DG Employment and Social Affairs, Youth Guarantee Country by Country: Belgium 2016,
<http://ec.europa.eu/social/main.jsp?catId=1161&intPageId=3324&langId=en>

OECD (2016), OCED Science, Technology and Innovation Outlook 2016, STI Belgium
<http://www.oecd.org/sti/Belgium.pdf>

SBA Factsheet 2015 Belgium,
<http://ec.europa.eu/DocsRoom/documents/16344/attachments/3/translations/en/renditions/native>

Abbreviations

AEI	Agency for Enterprise and Innovation (Wallonia)
AIO	Agentschap Innoveren en Ondernemen (Flanders)
BERD	Business Expenditures for Research and Development
BELSPO	Programmatory Public Service for Science Policy
CEN	Nuclear Energy Centre
CIS	International Co-operation Commission
EC	European Commission
ESA	European Space Agency
EU	European Union
EU-28	European Union including 28 Member States
EWI	Department of Economy, Science & Innovation of the Flemish Government
DG06	Operational Directorate of Economy, Employment and Research (Wallonia)
FP7	7th Framework Programme
FWO	Research Foundation Flanders Fund for Scientific Research (Flemish Community)
GDP	Gross Domestic Product
GERD	Gross Domestic Expenditure on R&D
H2020	Horizon 2020
HEI	Higher Education Institution
ICT	Information & Communication Technologies
IP	Intellectual Property
INNOVIRIS	Brussels Institute for Research and Innovation
IWT	Agency for Innovation by Science and Technology (Flanders)
PPS	Programmatory Public Service
PREC	Regional Circular Economy Programme
R&D	Research and Development
R&D&I	Research, Development and Innovation

R&I	Research and innovation
S3	Smart Specialisation Strategy
SCK	National Institute for Radio-elements
SME	Small and Medium-sized Enterprise
S.R.I.B/ G.I.M.B.	Brussels Regional Investment Company

Factsheet

	2009	2010	2011	2012	2013	2014	2015	2016
GDP per capita (euro per capita)	32300	33500	34500	35100	35400	35900	36500	
Value added of services as share of the total value added (% of total)	76.39	75.97	76.27	76.67	76.98	77.3	77.07	
Value added of manufacturing as share of the total value added (%)	14.28	14.72	14.25	14.08	14	13.99	14.27	
Employment in manufacturing as share of total employment (%)	12.6	12.11	11.97	11.75	11.52	11.18	10.91	
Employment in services as share of total employment (%)	78.7	79.27	79.43	79.67	79.98	80.45	80.86	
Share of Foreign controlled enterprises in the total nb of enterprises (%)		0.28	0.27	0.26	0.24			
Labour productivity per hour worked (Index, 2010=100)	97.9	100	99.5	99.2	99.6	101	101.9	
New doctorate graduates (ISCED 6) per 1000 population aged 25-34	1.04	1.18	0.77	1.27	1.31	1.36		
Summary Innovation Index (rank)	11	10	9	10	11	9	8	
Innovative enterprises as a share of total number of enterprises (CIS data 2012) (%)				55.6		64.2		
Innovation output indicator (Rank, Intra-EU Comparison)			10	10	11	12		
Turnover from innovation as % of total turnover (Eurostat)		12.4		11.2				
Country position in Doing Business (Ease of doing business index WB)(1=most business-friendly regulations)						41	43	42
Ease of getting credit (WB GII) (Rank)						80	81	
Venture capital investment as % of GDP (seed, start-up and later stage)	0.053	0.025	0.03	0.033	0.026	0.032	0.015	
EC Digital Economy & Society Index (DESI) (Rank)						5	5	5
E-Government Development Index Rank		16				25		19
Online availability of public services – Percentage of individuals having interactions with public authorities via Internet (last 12 months)	41	45	47	50	50	55	52	55
GERD (as % of GDP)	1.99	2.05	2.16	2.36	2.44	2.46	2.45	
GBAORD (as % of GDP)	0.66	0.65	0.63	0.64	0.64	0.68	0.63	
R&D funded by GOV (% of GDP)	0.5	0.52	0.5	0.68	0.69			
BERD (% of GDP)	1.31	1.38	1.48	1.68	1.72	1.75	1.77	
Research excellence composite indicator (Rank)				6				
Number of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country		12.41	12.48	12.7	12.88			
Public-private co-publications per million population	63.98	68.17	75.63	69.04	72.48	68.46		
World Share of PCT applications	0.73	0.72	0.69	0.67	0.57	0.65		

List of Figures

Figure 1 Development of government funding of the total GERD. 12

Figure 2. Top sectors in manufacturing (C20: Manufacture of chemicals and chemical products; C21: manufacture of basic pharmaceutical products and pharmaceutical preparations; C26: Manufacture of computer, electronic and optical products). Top service sectors (G=wholesale and retail trade, repair of motor vehicles and motorcycles, J=information and communication, M=professional, scientific and technical activities). 13

***Europe Direct is a service to help you find answers
to your questions about the European Union.***

**Freephone number (*):
00 800 6 7 8 9 10 11**

(*) The information given is free, as are most calls (though some operators, phone boxes or hotels may charge you).

More information on the European Union is available on the internet (<http://europa.eu>).

HOW TO OBTAIN EU PUBLICATIONS

Free publications:

- one copy:
via EU Bookshop (<http://bookshop.europa.eu>);
- more than one copy or posters/maps:
from the European Union's representations (http://ec.europa.eu/represent_en.htm);
from the delegations in non-EU countries (http://eeas.europa.eu/delegations/index_en.htm);
by contacting the Europe Direct service (http://europa.eu/europedirect/index_en.htm) or
calling 00 800 6 7 8 9 10 11 (freephone number from anywhere in the EU) (*).

(*) The information given is free, as are most calls (though some operators, phone boxes or hotels may charge you).

Priced publications:

- via EU Bookshop (<http://bookshop.europa.eu>).

JRC Mission

As the science and knowledge service of the European Commission, the Joint Research Centre's mission is to support EU policies with independent evidence throughout the whole policy cycle.



EU Science Hub
ec.europa.eu/jrc



@EU_ScienceHub



EU Science Hub - Joint Research Centre



Joint Research Centre



EU Science Hub



Publications Office

doi:10.2760/273083

ISBN 978-92-79-66212-6